

Watersheds: Cow Creek (tributary to the Sacramento River)**Sampling****Period:** May 2001 – August 2003**Project****Objectives:**

1. Assess existing water quality in Cow Creek and provide a basis for comparison with past and future studies;
2. Evaluate to what extent existing water quality may be limiting aquatic resources and other identified beneficial uses;
3. Develop data that can be used to evaluate the appropriateness of the 303(d) listing for fecal coliform;
4. Provide input to the Cow Creek Watershed Assessment, and provide information to assist in tracking future changes in water quality and watershed condition

KEY STATISTICS

Size of Cow Creek watershed	275,000 acres
Number of sites Sampled	16
Number of Constituents measured	9
Samples Taken	~520

MESSAGE:

Water quality information gathered from the five principal Cow Creek tributaries and one site on the main-stem indicated that fecal coliform concentrations exceeded standards for protection of contact recreation. The observed temperatures were seasonally elevated above the cold aquatic life objective. Additionally, degraded macroinvertebrate communities were identified in areas of the upper watershed.

WHAT IS THE MEASURE SHOWING?

The data gathered over an eighteen month period provides information on water quality from May 2001 – August 2003 and preliminary indications on the potential beneficial use impacts on the Cow Creek watershed.

Temperature data was consistent with previous studies and indicated that the lower and middle reaches of the five Cow Creek tributaries would not be supportive of cold water species through the summer season. Both fecal coliform and e-coli concentrations periodically exceeded standards and criteria for protection of contact recreation mostly in the three tributaries currently listed as impaired (Oak Run, Clover, and South Cow). Dissolved oxygen, pH, conductivity, and turbidity were all within 'normal' ranges. In North Cow, Clover, and South Cow Creeks, metrics used to assess macroinvertebrate community dynamics (Taxonomic Richness, EPT, Shannon Diversity, Percent Intolerant Taxa, Percent Tolerant Taxa) indicated a more degraded community from the upper watershed sites to the lower, while Old Cow Creek showed similar community metrics for all of the sites.

WHY IS THIS INFORMATION IMPORTANT?

The Cow Creek Watershed supports multiple beneficial uses (e.g. Contact Recreation and Aquatic Life) and is currently 303(d) listed for elevated fecal coliform levels (Oak Run, Clover, and South Cow Creek). Data collected as part of this study provided background water quality information for comparison to past studies and to evaluate the appropriateness of the 303(d) listing. The findings within this report can also help determine future program design by focusing resources toward tracking future changes in water quality and watershed condition.

Table 1: Summary of Potential Beneficial Use Concerns: Cow Creek (May 2001 – August 2003)

Beneficial Use/Indicator	North Cow			Oak Run			Clover Creek		Old Cow			South Cow			Old/ South Cow	Main stem
	U	M	L	U	M	L	U	L	U	M	L	U	M	L	L	
Drinking Water																
Specific Conductivity (900 umhos/cm, CA Dept of Public Health)																
<i>E. coli</i> (PA)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Aquatic Life																
pH (6.5 - 8.5, Basin Plan)		X	X			X	X	X					X		X	X
Temperature (20-C: Calfed Guideline, April 1 – June 30 & Sept 1 – Nov 30)		X	X		X	X		X		X			X		X	X
Dissolved Oxygen (7.0 mg/l, Basin Plan)																
Irrigation Water Supply																
Specific Conductivity (700 umhos/cm, Food & Ag Org. of United Nations)																
Recreation (Swimming)				303(d)			303(d)		303(d)			303(d)				
Fecal Coliform (400 MPN/100ml, Basin Plan)	NS	X	X	NA	X	X	X	X	NS		NS		NS			
<i>E. coli</i> (<235 MPN/100ml, USEPA Recreation Guideline for Designated Swimming areas)		X	X	X	X	X	X	X	X	X	X		X	X	X	X

U = upper

M = middle

L = lower

X = one or more result above a goal or objective

PA = Present/ Absent, P = Present

303(d) = 303(d) listed

NA = There is no goal or objective applicable

NS = No sample collected

() = Criteria used to evaluate data for this table

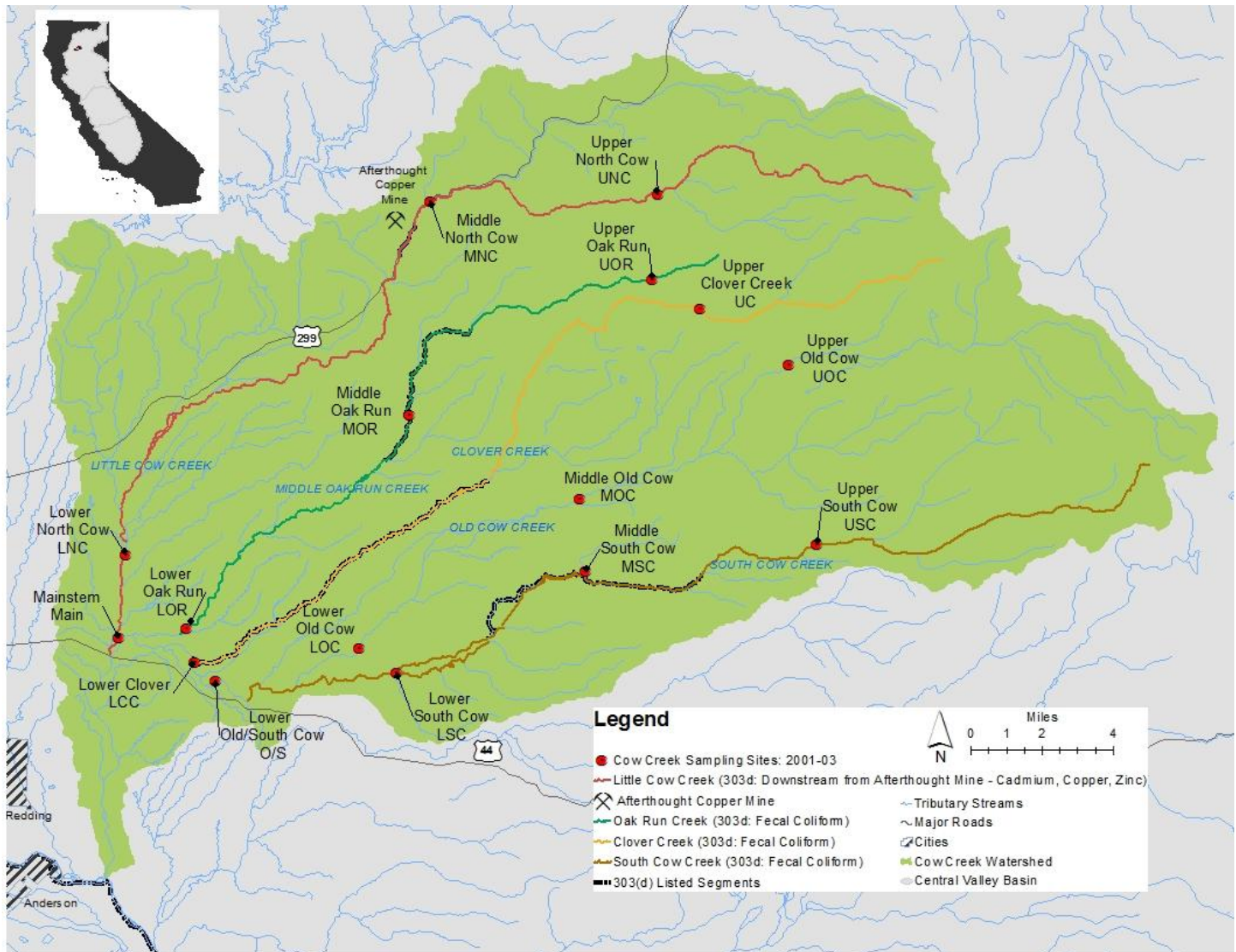
WHAT FACTORS INFLUENCE THE MEASURE?

Land Use: Land use and ownership is evenly divided between commercial forestland, irrigated and non-irrigated rangeland, and small rural property owners.

Hydrology: The tributaries of the Cow Creek watershed include Little Cow, Oak Run, Clover, Old Cow, and South Cow Creek. The total basin area for the watershed is 430 square miles and the total stream length of the tributaries and Cow Creek main stem is 47.8 miles. The main stem begins at the confluence of South Cow and Old Cow Creeks. From there it flows west for seven miles where it joins with Clover Creek, and then joins Oak Run Creek. The mainstem and Little Cow Creek converge further downstream, at the Highway 44 bridge crossing, and then the mainstem continues south for approximately 7.5 miles where it empties into the Sacramento River, 23 miles downstream of Shasta Dam and 4 miles east of the town of Anderson.

Water Year Type: 2001 and 2002 were classified as “Dry” years, and 2003 was classified as “Above Normal”, based on the California Department of Water Resources Snow Surveys as applied to criteria in the Basin Plan. A summary of historic water year types is located at <http://cdec.water.ca.gov/cgi-progs/iodir/wsahist>.

Flow: Data from the USGS gauging station on lower Cow Creek showed that flows during the 2001 (ranging from 12 cfs in August to 2530 cfs in December) and 2002 (ranging from 15 cfs in August to 2016 cfs in December) were lower than the historic average (1950 – 1998). The 2003 flows (38 cfs in September to 2194 cfs) were normal relative to the historic average.

Site Locations:**TECHNICAL CONSIDERATIONS:**

- *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern. Samples were collected by Central Valley Regional Water Quality Control Board – Redding, staff and analyzed by staff and Basic Laboratory. NOTE: Report indicates QA concerns with the results and that the data is provided for informational purposes only
- Bioassessment is an indicator of aquatic community health but is not currently utilized as an independent regulatory tool. Samples were collected by Central Valley Regional Water Quality Control Board – Redding, staff and analyzed by Basic Laboratory.
- Flow data was collected from the USGS Millville gage in mainstem Cow Creek and Central Valley Water Board staff.
- All other constituents measured in the field by Central Valley Regional Water Quality Control Board – Redding staff.
- Completeness (percentage of samples actually taken, compared to how many that were planned, based on Appendix A in the report. NOTE: there is no indication in Appendix A whether the data gaps were planned, so a total of 545 samples is assumed for the following constituents.)
 - Temperature (hand measurement): 65%

- Dissolved Oxygen: 54%
- Conductivity: 62%
- pH: 62%
- Turbidity: 63%
- Fecal coliform: 25%
- E. coli : 48% (Central Valley Regional Water Quality Control Board – Redding staff), 11% (Basic Laboratory)
- References:
 - Central Valley Regional Water Quality Control Board (CVRWQCB). 2007. Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins, Fourth Edition, August 2006.
 - Public report (including raw data) and fact sheet are available at:
http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_studies/surface_waterambient_monitoring/swamp_water_quality_reports/swamp_report_summary_sheet/index.shtml
 - Hydrology information courtesy of:
 Morgan J. Hannaford and North State Institute for Sustainable Communities. 2000. Preliminary Water Quality Assessment of Cow Creek Tributaries. <http://www.sacriver.org/documents/watershed/cowcreek/general/cowcrkpt.pdf>

Sampling Schedule:

	North Cow			Oak Run			Clover Creek		Old Cow			South Cow			Old/ South Cow	Main stem	USGS Millville flow gage (Cow Creek)
	U	M	L	U	M	L	U	L	U	M	L	U	M	L	L		
Jan-01 – Apr-01																	X
May-01		2	2		2	2	2	2		2		2			2	2	X
Jun-01		3	3		3	3	3	3		3		3	3		3	3	X
Jul-01		4	4		4	4	4	4		4		4	4		4	4	X
Aug-01		2	4		2	4	2	4		2		2	4		4	4	X
Sep-01		2	2		2		2			2		2	2		2	2	X
Oct-01 – Mar-02																	X
Apr-02		FC	FC		FC	FC	FC	FC		FC		FC	FC	FC	FC	FC	X
May-02		5	5		5	5	5	5		5		5	6	7	5	5	X
Jun-02		8	8		8	8	8	8		8		8	8	9	8	8	X
Jul-02		10	10		10	10	10	10		10		10	11	X	10	10	X
Aug-02		11	11		11		11	11		11		11	11		11	11	X
Sep-02																	X
Oct-02		10	10		10	X	10	10		10		10	11	X	10	10	X
Nov-02 – May 03																	X
Jun-03	13	13	13	13	13	13	13	13	13	13	12	13	13	13	13	12	X
Jul-03	8	8	8	8	8	4	8	8	8	8	-F	8	8	8	8	8	X
Aug-03	8	8	8	8	8	14	8	8	8	8		8	8	8	8	8	X
Sep-03																X	X

Key for Sampling Schedule table:

1	Conductivity	Dissolved Oxygen	E. coli	Fecal Coliform	Flow	pH	Temperature	Turbidity	Macroinvertebrates
2	Conductivity	Dissolved Oxygen	E. coli	Fecal Coliform		pH	Temperature	Turbidity	
3	Conductivity	Dissolved Oxygen		Fecal Coliform		pH	Temperature	Turbidity	
4	Conductivity	Dissolved Oxygen	E. coli			pH	Temperature	Turbidity	
5	Conductivity		E. coli	Fecal Coliform	Flow	pH	Temperature		
6	Conductivity		E. coli	Fecal Coliform		pH	Temperature		
7			E. coli	Fecal Coliform	Flow				
8	Conductivity	Dissolved Oxygen	E. coli		Flow	pH	Temperature	Turbidity	
9			E. coli		Flow				
10	Conductivity	Dissolved Oxygen			Flow	pH	Temperature	Turbidity	
11	Conductivity	Dissolved Oxygen				pH	Temperature	Turbidity	
12			E. coli		Flow				Macroinvertebrates
13					Flow				Macroinvertebrates
14			E. coli					Turbidity	
X	Flow Only		FC	Fecal Coliform Only	-F	Temperature (f) only			